

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Roland A. Wood

Examiner: Shun Lee

Serial No.: 09/800,366

Group Art Unit: 2884

Filed: March 06, 2001

Docket: 256.087US1

For: IMPROVED BOLOMETER OPERATION USING FAST SCANNING

APPEAL BRIEF UNDER 37 CFR § 41.37

Mail Stop Appeal Brief- Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is presented in response to the Notice of Panel Decision from Pre-Appeal Brief Review mailed on August 14, 2009 and further in support of the Notice of Appeal to the Board of Patent Appeals and Interferences, filed on November 26, 2008, from the Final Rejection of claims 1-12, 14-25, 27, 29-38 of the above-identified application, as set forth in the Final Office Action mailed on September 9, 2008.

The Commissioner of Patents and Trademarks is hereby authorized to charge Deposit Account No. 19-0743 in the amount of \$540.00 which represents the requisite fee set forth in 37 C.F.R. § 41.20(b)(2). The Appellants respectfully request consideration and reversal of the Examiner's rejections of pending claims.

1. REAL PARTY IN INTEREST

The real party in interest of the above-captioned patent application is the assignee,
HONEYWELL INTERNATIONAL INC.

2. RELATED APPEALS AND INTERFERENCES

This application, U.S. Serial Application No. 09/800,366, was involved in a previous appeal (2007-1983) to the Board of Patent Appeals and Interferences via a Notice of Appeal dated May 27, 2004. The Board of Patent Appeals and Interferences rendered its decision in that previous appeal on September 19, 2007. A copy of the Board's September 19, 2007 opinion is attached hereto in the Appendix.

3. STATUS OF THE CLAIMS

The application was filed on March 6, 2001 with claims 1-26. A non-final Office Action dated May 29, 2002 rejected claims 1-26. An amendment dated August 29, 2002 added claims 27-39. A final Office Action dated November 27, 2002 maintained the rejection of claims 1-26, and rejected newly added claims 27-39. An amendment dated January 21, 2003 canceled claim 28. An Advisory Action dated February 24, 2003 maintained the rejection of the claims. A Request for Continued Examination was filed on May 27, 2003. A non-final Office Action dated June 27, 2003 and a final Office Action dated December 31, 2003 maintained the rejection of claims 1-27 and 29-39. A Notice of Appeal was filed on May 27, 2004, and the Board issued a decision on September 19, 2007 sustaining the rejection of the claims. A Request for Continued Examination was filed on November 26, 2007, which canceled claims 13, 26 and 39. A non-final Office Action dated February 13, 2008 rejected claims 1-12, 14-25, 27, and 29-38, and a final Office Action dated August 26, 2008 maintained the rejection of claims 1-12, 14-25, 27, and 29-38.

Claims 13, 26, 28, and 39 remain canceled. Claims 1-12, 14-25, 27, and 29-38 stand twice rejected, remain pending, and are the subject of the present appeal.

4. STATUS OF AMENDMENTS

No amendments have been made subsequent to the Final Office Action dated August 26, 2008.

5. SUMMARY OF CLAIMED SUBJECT MATTER

Aspects of the present inventive subject matter include, but are not limited to, an improved bolometer operation using fast scanning.

Independent Claim 1

An embodiment, such as recited in independent claim 1, relates to a method for improving the performance sensitivity and the facility of operation of an array of microbolometers (p. 9, line 20 - p. 10, line 21; FIG. 1, No. 110; FIG. 8, Nos. 810 – 840; FIG. 9, No. 110). The method includes applying N bias pulses substantially sequentially during a frame time to each microbolometer in the array, wherein N is 2 or greater (p. 3, line 27 – p. 4, line 1; FIG. 8, No. 810), and wherein the N bias pulses have a shorter time duration and frequency (page 8, lines 1 - 20). The N bias pulses are selected such that a resulting temperature in each of the microbolometers in the array due to such applying of the N bias pulses is substantially uniform during the frame time (p. 4, lines 1 – 2; page 9, lines 22-24; FIG. 5, No. 530). The time duration of each bias pulse is 1/N times that of a single pulse suitable for reading the array (page 8, lines 21-28; FIG. 5). The method also includes measuring N resulting signals corresponding to the N bias pulses (p. 4, lines 2-3; p. 10, lines 2 – 4; FIG. 8, No. 820), and computing an average signal value from the N resulting signals corresponding to each microbolometer in the array during the frame time (p. 4, lines 4 -5; p. 10, lines 5-6; FIG. 8, No. 830). The method further includes producing an output signal based on the computed average signal value for each microbolometer in the array during the frame time (p. 4, lines 5 – 7; p. 10, lines 7 – 9; FIG. 8, No. 840).

Independent Claim 14

Another embodiment, such as recited in independent claim 14, relates to an infrared radiation detector apparatus (p. 10, line 22 – p. 12, line 6; FIG. 9, No. 900). The apparatus includes microbolometers in an array (p. 5, lines 5-6; FIG. 1, No. 110; FIG. 9, No. 110). The apparatus includes a timing circuit coupled to the array to apply N bias pulses substantially sequentially to each microbolometer in the array during a frame time (p. 3, line 27 – p. 4, line 1;

FIG. 8, No. 810) such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time (p. 4, lines 1 – 2; page 9, lines 22-24; FIG. 5, No. 530). The apparatus also includes a measuring circuit coupled to the array to measure N resulting signals associated with each of the applied N bias pulses during the frame time (p. 4, lines 2-3; p. 11, lines 13 – 16; FIG. 9, No. 930), and a computing circuit coupled to the measuring circuit to compute an average signal value for each microbolometer in the array from the measured N resulting signals during the frame time (p. 4, lines 4 -5; FIG. 9, No. 940). The apparatus further includes an output circuit coupled to the computing circuit to produce an output signal based on the computed average signal value for each microbolometer in the array during the frame time (p. 4, lines 5 – 7; FIG. 9, No. 950).

Independent Claim 27

Another embodiment, such as recited in independent claim 27, relates to a signal processing electronics circuit for an array of microbolometers (p. 5, lines 5-6; FIG. 1, No. 110; FIG. 9, Nos. 110, 900; p. 10, line 22 – p. 12, line 6). The circuit includes a timing circuit coupled to the array to apply N bias pulses substantially sequentially to each microbolometer in the array during a frame time (p. 3, line 27 – p. 4, line 1; FIG. 8, No. 810) such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses varies less than one degree Celsius during the frame time, wherein N is greater than one and such that the length and frequency of pulses reduce noise compared to N=1 pulses in a frame time (page 8, line 21 – page 9, line 8; FIG. 5, No. 500). The circuit also includes a measuring circuit coupled to the array to measure N resulting signals, respectively associated with each of the applied bias pulses during the frame time (p. 4, lines 2-3; p. 11, lines 13 – 16; FIG. 9, No. 930), and a computing circuit coupled to the measuring circuit to compute an average signal value for each microbolometer in the array from the measured resulting signals during the frame time (p. 4, lines 4 -5; FIG. 9, No. 940). The circuit further includes an output circuit coupled to the computing circuit to produce an output signal based on the computed average signal value for each microbolometer in the array during the frame time (p. 4, lines 5 – 7; FIG. 9, No. 950).

This summary does not provide an exhaustive or exclusive view of the present subject matter, and the Appellant refers to each of the appended claims and its legal equivalents for a complete statement of the invention.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1, 2, 7-12, 14-17, 20-25, 27, 29, 33-38 were rejected under 35 U.S.C. 103(a) as being unpatentable over Wood et al. (U.S. Patent No. 5,675,149), and incorporated by reference U.S. Patent No. 5,420,419 (Wood) in view of Duvall (U.S. Patent No. 5,258,619).

Claims 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wood et al. and incorporated by reference U.S. Patent 5,420,419 in view of Duvall, III as applied to claim 2, and further in view of Applicant Admitted Prior Art.

Claim 6 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Wood et al. and incorporated by reference U.S. Patent 5,420,419 in view of Duvall, III as applied in view of Applicant Admitted Prior Art as applied to claim 5, and further in view of Thiede et al. (U.S. 5,129,595).

Claims 18, 19 and 30-32 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wood et al. and incorporated by reference U.S. Patent 5,420,419 in view of Duvall, III as applied to claims 17 and 29, and further in view of Thiede et al. (U.S. 5,129,595).

7. ARGUMENT

Applicable Law Under 35 U.S.C. § 103(a)

A patent may not be obtained for an invention, even though the invention is not identically disclosed or described in a single patent or other publication, if the differences between the subject matter of the invention and the prior art are such that the subject matter as a whole would have been obvious at the time that the invention was made to a person having ordinary skill in the art to which the subject matter of the invention pertains.¹ An obviousness analysis under § 103 is objective. That is, the scope and content of the prior art are determined, the differences between the prior art and the claims at issue are ascertained, and the level of ordinary skill in the pertinent art is resolved. It is against this background that the obviousness or nonobviousness of the subject matter is determined. Other considerations such as commercial success, long felt but unsolved need, and the failure of others might be utilized to shed light on the circumstances surrounding the origin of the subject matter sought to be patented.² While the obviousness analysis need not seek out precise teachings directed to the specific subject matter of a claim, the analysis should nevertheless be explicit, including some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness, and not based on mere conclusory statements.³ An indication of a teaching, suggestion, or motivation in the prior art may be part of this analysis, since there is no necessary inconsistency between the idea underlying the teaching, suggestion, and motivation test and the *Graham* analysis. However, the general principle of the teaching, suggestion, and motivation test should not be transformed into a rigid rule that limits the obviousness inquiry.⁴ Rather, the approach to the determination of obviousness or nonobviousness should remain expansive and flexible.⁵ And further while there is a need for caution in granting a patent based on a combination of elements found in the prior art,⁶ a patent composed of several elements is not proved obvious merely by showing that each

¹ 35 U.S.C. § 103(a).

² *KSR International Co. v. Teleflex Inc.*, 550 U.S. ____ , p. 2 slip opinion (2007), citing *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 15-17 (1966).

³ *Id.*, p.14, citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

⁴ *Id.*, p. 15.

⁵ *Id.*, p. 11.

⁶ *Id.*, p.11.

of its elements was, independently, known in the prior art. Therefore, it can be important to identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does.⁷

Rejection of Claims 1-12, 14-25, 27, and 29-38 under 35 U.S.C. § 103(a)

Claims 1, 2, 7-12, 14-17, 20-25, 27, 29 and 33-38 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wood et al. (U.S. 6,675,149) and incorporated by reference U.S. Patent 5,420,419 (Wood) in view of Duvall, III (U.S. 5,258,619).

Claims 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wood et al. and incorporated by reference U.S. Patent 5,420,419 in view of Duvall, III as applied to claim 2, and further in view of Applicant Admitted Prior Art.

Claim 6 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Wood et al. and incorporated by reference U.S. Patent 5,420,419 in view of Duvall, III as applied in view of Applicant Admitted Prior Art as applied to claim 5, and further in view of Thiede et al. (U.S. 5,129,595).

Claims 18, 19 and 30-32 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wood et al. and incorporated by reference U.S. Patent 5,420,419 in view of Duvall, III as applied to claims 17 and 29, and further in view of Thiede et al. (U.S. 5,129,595).

The Appellant respectfully seeks the reversal of these rejections. In short, the Final Office Action is apparently equating the slider mechanism of the '149 patent with applying N bias pulses substantially sequentially during a time frame. However, the Appellant respectfully submits that the slider mechanism of the '149 patent has nothing to do with bias pulses at all, and respectfully submits that for at least this reason the rejections of the claims should be withdrawn.

Claim 1 recites a method for improving the performance, sensitivity, and facility of operation of an array of microbolometers including applying N bias pulses substantially sequentially during a frame time to each microbolometer in the array, wherein N is 2 or greater, and wherein the N bias pulses have a shorter time duration and frequency, selected such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time, wherein the time duration of each bias

⁷ *Id.*, pp. 14-15.

pulse is $1/N$ times that of a single pulse suitable for reading the array. Claim 1 further recites measuring N resulting signals corresponding to the N bias pulses, and computing an average signal value from the N resulting signals corresponding to each microbolometer in the array during the frame time. The Final Office Action contends that these features are disclosed in the '149 patent at column 5, lines 47-53. The Appellant respectfully disagrees.

The '149 patent, at lines 39-53 of column 5, states:

During the interval in which the camera is held steady, the digital processor 36 commands the slider mechanism 46 to slide the moveable board 41 across the focal plane of the lens 42 at a controlled rate whilst sensor signals are digitized by the digital processor 36 and stored in memory 38. For each lateral slide movement of the array 10 by a distance equal to a pixel width, the electrical signal from each pixel 11 in the array 10 is measured and stored. If desired, slower slide velocities, or multiple scans of any desired region of the scene, can be employed to allow sensitivity improvement by multiple measurement and averaging of sensor signals: in this case, a stable platform for example, a tripod mounting of the camera may be required, analogous to long exposures of visible photographic still frame cameras.

With all due respect, the Appellant respectfully submits that the above-cited portion of the '149 patent does not disclose applying N bias pulses substantially sequentially during a time frame, or measuring the signals or computing an average signal value resulting from those N bias pulses. While the Final Office Action has not expounded upon its contention, if the Final Office Action is citing the above portion of the '149 patent for the disclosure of a sliding mechanism, the Appellant respectfully submits that a lateral slide movement of a slider mechanism over a pixel does not disclose N bias signals during a time frame. Similarly, multiple scans of a desired region of a frame by the slider mechanism does not disclose N bias pulses substantially sequentially during a time frame.

The Final Office Action concedes that the '149 patent does not disclose that the N bias pulses have a shorter time duration and frequency, or are selected such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time, wherein the time duration of each bias pulse is $1/N$ times that of a single pulse suitable for reading the array. However, the Final Office

Action contends that this feature is disclosed in the '619 patent to Duvall at column 6, lines 43-53. The Appellant respectfully disagrees.

This section of the '619 patent relates only to using different wave shapes in a swept bias (as compared to using a constant bias, *see* column 4, lines 14-16 of the '619 patent). Just as in the '149 patent, there is simply no disclosure of applying N bias pulses substantially sequentially during a time frame, and there is surely not a disclosure of N bias pulses that have a shorter time duration and frequency, or that are selected such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time, wherein the time duration of each bias pulse is 1/N times that of a single pulse suitable for reading the array.

Since the references of record lack these features of claim 1, the Appellant respectfully submits that the Final Office Action has failed to establish a *prima facie* case of obviousness, and respectfully seeks the reversal of the rejection of claim 1 and the claims dependent on claim 1.

Further, since independent claim 14, and the claims dependent thereon, include the feature of "a timing circuit coupled to the array to apply N bias pulses substantially sequentially to each microbolometer in the array during a frame time such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time," the Appellant respectfully submits that a *prima facie* case of obviousness has not been established for these claims either, and respectfully seeks the reversal of the rejection of claim 14 and the claims dependent on claim 14.

Independent claim 27 recites in part a signal processing circuit for an array including microbolometers that includes a timing circuit for applying N bias pulses substantially sequentially to each microbolometer in the array during a frame time such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses varies less than one degree Celsius during the frame time. In its rejection of claim 12, which recites the feature of varying less than one degree Celsius, the Final Office Action admits that the '149 patent does not disclose a temperature variation of less than one degree Celsius. However, the Final Office Action contends that this feature is disclosed in the Duvall reference at column 6, lines 43-53. The Appellant respectfully disagrees. The cited portion of Duvall mentions nothing about a temperature variation of less than one degree Celsius. The Appellant

respectfully submits that the Final Office Action has failed to established a *prima facie* case of obviousness for claim 27, and respectfully seeks the reversal of the rejection of claim 27, and the claims that are dependent on claim 27.

SUMMARY

For the reasons argued above, the pending claims were not properly rejected under 35 U.S.C. § 103(a) as being unpatentable over the cited references. It is respectfully submitted that the references cited do not render the claims obvious and that the claims are patentable over the cited references. Reversal of the rejections and allowance of the pending claims are respectfully requested.

Respectfully submitted,

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Date September 14, 2009 By

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the USPTO's electronic filing system EFS-Web, and is addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 18th day of September 2009.

DAWN M. POOLE

.....
Name

1 Dawn M. Poole 1
Signature

8. CLAIMS APPENDIX

1. A method for improving performance sensitivity and facility of operation of an array including microbolometers, comprising:

applying N bias pulses substantially sequentially during a frame time to each microbolometer in the array, wherein N is 2 or greater, and wherein the N bias pulses have a shorter time duration and frequency, selected such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time, wherein the time duration of each bias pulse is 1/N times that of a single pulse suitable for reading the array;

measuring N resulting signals corresponding to the N bias pulses;

computing an average signal value from the N resulting signals corresponding to each microbolometer in the array during the frame time; and

producing an output signal based on the computed average signal value for each microbolometer in the array during the frame time.

2. The method of claim 1, further comprising:

repeating the applying, measuring, computing, and producing steps to compute output signals during each frame time.

3. The method of claim 2, further comprising:

applying a corrective electrical signal to the output signal to correct for resistance non-uniformity between the microbolometers in the array to obtain a substantially uniform output signal value.

4. The method of claim 3, further comprising:

converting the substantially uniform output signal value associated with each microbolometer in the array to a digital signal value.

5. The method of claim 4, further comprising:
passing the digital signal value associated with each microbolometer in the array through a digital image processor to correct for image defects.
6. The method of claim 5, wherein the image defects comprises:
image defects selected from the group consisting of fine offsets, gain non-uniformity, and dead pixels.
7. (Original) The method of claim 1, wherein the bias pulses are substantially equal in magnitude.
8. (Original) The method of claim 1, wherein the bias pulses are substantially equally spaced in time.
9. The method of claim 1, wherein the bias pulses comprise:
voltage bias pulses.
10. The method of claim 1, wherein the N resulting signals comprises:
N current signals.
11. The method of claim 1, wherein N is in the range of about 2 to 100 bias pulses.
12. The method of claim 1, wherein each of the N bias pulses has a time duration in the range of about 0.1 to 20 microseconds and wherein the temperatures varies less than one degree Celsius.
14. An infrared radiation detector apparatus, comprising:
microbolometers in an array;

a timing circuit coupled to the array to apply N bias pulses substantially sequentially to each microbolometer in the array during a frame time such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time;

a measuring circuit coupled to the array to measure N resulting signals associated with each of the applied N bias pulses during the frame time;

a computing circuit coupled to the measuring circuit to compute an average signal value for each microbolometer in the array from the measured N resulting signals during the frame time; and

an output circuit coupled to the computing circuit to produce an output signal based on the computed average signal value for each microbolometer in the array during the frame time.

15. The apparatus of claim 14, wherein the output circuit further comprises:

an integrator and an A/D converter wherein said output signal produced is a digital signal value for each microbolometer in the array.

16. The apparatus of claim 15, further comprising:

a digital image processor, coupled to the output circuit to receive the digital signal value associated with each microbolometer of the array and correct the received digital signal value for image defects.

17. The apparatus of claim 16, wherein the digital image processor further comprises:

a correction circuit, to apply a corrective electrical signal based on a correction value to the output signal to correct for resistance non-uniformity in each microbolometer to obtain a uniform output signal value.

18. The apparatus of claim 17, wherein the correction circuit further corrects the uniform output signal value for fine offsets, gain non-uniformity, or dead pixels.

19. The apparatus of claim 18, wherein the digital image processor further comprises:
digital memories to store the correction values for each microbolometer in the array.
20. The apparatus of claim 14, wherein the N bias pulses are substantially equal in magnitude.
21. The apparatus of claim 20, wherein the N pulses are substantially equally spaced in time.
22. The apparatus of claim 14, wherein the N bias pulses are voltage bias pulses.
23. (Original) The apparatus of claim 22, wherein the resulting signals are current signals.
24. The apparatus of claim 14, wherein the N bias pulses are in the range of about 2 to 100 bias pulses.
25. The apparatus of claim 24, wherein the N bias pulses have time duration in the range of about 0.1 to 20 microseconds.
27. A signal processing electronics circuit for an array including microbolometers, comprising:
 - a timing circuit coupled to the array to apply N bias pulses substantially sequentially to each microbolometer in the array during a frame time such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses varies less than one degree Celsius during the frame time, wherein N is greater than one and such that the length and frequency of pulses reduce noise compared to N=1 pulses in a frame time;
 - a measuring circuit coupled to the array to measure N resulting signals, respectively associated with each of the applied bias pulses during the frame time;

a computing circuit coupled to the measuring circuit to compute an average signal value for each microbolometer in the array from the measured resulting signals during the frame time; and

an output circuit coupled to the computing circuit to produce an output signal based on the computed average signal value for each microbolometer in the array during the frame time.

29. The circuit of claim 27, wherein the output circuit further comprises:

an integrator and an A/D converter wherein said output signal produced is a digital signal value for each microbolometer in the array.

30. The circuit of claim 29, further comprising:

a digital image processor coupled to the output circuit to receive the digital signal value associated with each microbolometer to correct for image defects such as fine offsets, gain non-uniformity or dead pixels.

31. The circuit of claim 30, wherein the digital image processor further comprises:

a correction circuit to apply a corrective electrical signal based on a correction value to the output signal to correct for any resistance non-uniformity in each microbolometer to obtain a uniform output signal value.

32. The circuit of claim 31, further comprising:

a memory to store the correction value associated with each microbolometer in the array.

33. The circuit of claim 27, wherein the N bias pulses are substantially equal in magnitude.

34. The circuit of claim 33, wherein the N bias pulses are substantially equally spaced in time.

35. The circuit of claim 27, wherein the N bias pulses are voltage bias pulses.

36. The circuit of claim 35, wherein the resulting signals are current signals.
37. The circuit of claim 27, wherein the N bias pulses are in the range of about 2 to 100 bias pulses.
38. The circuit of claim 37, wherein the N bias pulses have time duration in the range of about 0.1 to 20 microseconds.

9. EVIDENCE APPENDIX

None.

10. RELATED PROCEEDINGS APPENDIX

This application, U.S. Serial Application No. 09/800,366, was involved in a previous appeal (2007-1983) to the Board of Patent Appeals and Interferences via a Notice of Appeal dated May 27, 2004. The Board of Patent Appeals and Interferences rendered its decision in that previous appeal on September 19, 2007. A copy of the Board's September 19, 2007 opinion is attached hereto.